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SOLUTION.

If $OP = R$, $OA = \frac{1}{2}R$. The triangles, AOB and RBS are similar;
 $\therefore OB = \frac{1}{2}BR = \frac{1}{3}R$. The triangles OBC and TCS are similar and $OB = \frac{1}{3}R = \frac{1}{3}ST$; $\therefore OC = \frac{1}{3}CS = \frac{1}{4}R$. And so on.

$$\therefore OP : OA : OB : OC : \dots :: 1 : \frac{1}{2} : \frac{1}{3} : \frac{1}{4} : \dots \quad [W. B. Richards.]$$

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If a triangle be cut out of paper and doubled over so that the crease passes through the centre of the circumscribing circle and the angle A , the area of the triangular double-part will be

$$\frac{1}{2}b^2 \sin^2 C \cos C \operatorname{cosec} (2C - B) \sec (C - B);$$

the angle C being greater than B .

[Yale.]

SOLUTION.

Call O the centre of the circumscribed circle. OA cuts BC in D . Make $\angle ADF = \angle ADC$. DF cuts AB in F . Take DE on $DC = DF$. Then DAE is the triangle required.

We know that $\angle ADE = 90^\circ - (C - B)$, and $\angle BAD = \angle ADE = 90^\circ - C$; also

$$\text{area } DAE = \frac{1}{2} \frac{\overline{AD}^2 \sin DAE \sin ADE}{\sin (DAE + ADE)}.$$

$$\text{But } AD = \frac{b \sin C}{\sin ADE};$$

$$\begin{aligned} \therefore \text{area } DAE &= \frac{1}{2} \frac{b^2 \sin^2 C \sin DAE}{\sin ADE \sin (DAE + ADE)} \\ &= \frac{1}{2} b^2 \sin^2 C \cos C \sec (C - B) \operatorname{cosec} (2C - B). \end{aligned}$$

[T. U. Taylor.]

EXERCISE.

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A hollow sphere, external and internal radii R and r , and specific gravity s , is partly filled with water, and floats in a pond, the water in the sphere being on a level with the surface of the pond. Find the quantity of water in the hollow sphere.

[Artemas Martin.]